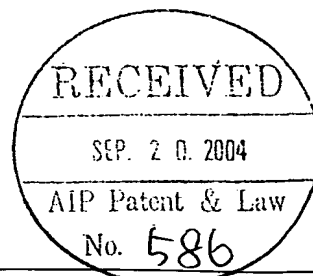


PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)



| | | |
|---|--|---|
| Applicant's or agent's file reference P04-5003 | FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below. | |
| International application No. PCT/KR2004/001153 | International filing date (<i>day/month/year</i>) 14 MAY 2004 (14.05.2004) | (Earliest) Priority Date (<i>day/month/year</i>) 28 MAY 2003 (28.05.2003) |
| Applicant SEOUL SEMICONDUCTOR CO., LTD. et al | | |

This International search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ The international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box No. II)

3. ☐ **Unity of invention is lacking** (See Box No. III)

4. With regard to the title,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the drawings,

a. the figure of the **drawings** to be published with the abstract is Figure No. 5

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

b. ☐ none of the figure is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2004/001153

A. CLASSIFICATION OF SUBJECT MATTER**IPC7 H01L 33/00, H01L 23/34**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean patents and applications for inventions, since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|---|-----------------------|
| A, D | US 6274924 B (LUMILEDS LIGHTINGS U.S. L.L.C.) 14 AUGUST 2001 see the abstract, figure 2 | 1-14 |
| A | US 6204523 B (LUMILEDS LIGHTINGS U.S. L.L.C.) 20 MARCH 2001 see the whole documents, figure 1 | 1-14 |
| A | KR 2001-114224 A (GENTEX CORPORATION) 31 DECEMBER 2001 see figures 16-24 | 1-14 |
| A | JP 2000-244022 A (NICHIA CHEMICALS CO. LTD) 08 SEPTEMBER 2000 see the abstract | 1-14 |
| A | US 5748658 (MATSUSHITA ELECTRIC INDUSTRIAL CO. LTD) 5 MAY 1998 see the abstract, figure 22 | 1-14 |

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance
 "E" earlier application or patent but published on or after the international filing date
 "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)
 "O" document referring to an oral disclosure, use, exhibition or other means
 "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
 "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
 "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
 "&" document member of the same patent family

Date of the actual completion of the international search

04 SEPTEMBER 2004 (04.09.2004)

Date of mailing of the international search report

07 SEPTEMBER 2004 (07.09.2004)

Name and mailing address of the ISA/KR



Korean Intellectual Property Office
920 Dunsan-dong, Seo-gu, Daejeon 302-701,
Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

KIM, Dong Yup

Telephone No. 82-42-481-5749



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2004/001153

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---------------------|----------------------------|---------------------|
| US 6274924 B | 14.08.2001 | GB 2343548 A1 | 10.05.2000 |
| | | DE 19945675 A1 | 18.05.2000 |
| | | KR 2000035156 A | 26.06.2000 |
| | | JP 2000150967 A | 30.05.2000 |
| | | TW 441045 B | 16.06.2001 |
| US 6204523 B | 20.03.2001 | DE 19938053 A1 | 18.05.2000 |
| | | GB 2343549 A1 | 10.05.2000 |
| | | JP 2000150968 A | 30.05.2000 |
| | | TW 424339 B | 01.03.2001 |
| | | US 2001010371 AA | 02.08.2001 |
| | | US 6590235 B | 08.07.2003 |
| KR 2001-114224 A | 31.12.2001 | CA 2373368 AA | 21.09.2000 |
| | | AU 200038995 A5 | 04.10.2000 |
| | | AU 200035279 A5 | 04.10.2000 |
| | | CA 2367011AA | 21.09.2000 |
| | | WO 200055914 A1 | 21.09.2000 |
| | | US 2001026011 AA | 04.10.2001 |
| | | EP 1169735 A1 | 09.01.2002 |
| | | EP 1169668 A1 | 09.01.2002 |
| | | US 6441943 BA | 27.08.2002 |
| | | US 2002154379 AA | 24.10.2002 |
| | | JP 2002539623 T2 | 19.11.2002 |
| | | JP 2002539026 T2 | 19.11.2002 |
| | | US 2002004251 AA | 10.01.2002 |
| | | US 6335548 BA | 01.01.2002 |
| | | EP 1169735 A4 | 06.08.2003 |
| | | EP 1169668 A4 | 13.08.2003 |
| | | US 6700692 B | 02.03.2004 |
| | | US 6670207 BA | 30.12.2003 |
| | | US 2003168670 AA | 11.09.2003 |
| | | US 2003002179 AA | 02.01.2003 |
| JP 2000-244022 A | 08.09.2000 | US 6521916 B | 18.02.2003 |
| | | US 2004084681 AA | 06.05.2004 |
| JP 2000-244022 A | 08.09.2000 | JP 3217322 B | 09.10.2001 |
| US 5748658 | 05.05.1998 | JP 06-203403 A | 22.07.1994 |

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

LEE, Soo-Wan

1901-ho, Keungil Tower 19F, 677-25 Yeoksam-dong
Gangnam-gu Seoul 135-914, Republic of Korea

PCT

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

(PCT Rule 43bis.1)

Date of mailing
(day/month/year) 07 SEPTEMBER 2004 (07.09.2004)

Applicant's or agent's file reference
P04-5003

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/KR2004/001153

International filing date (day/month/year)

14 MAY 2004 (14.05.2004)

Priority date(day/month/year)

28 MAY 2003 (28.05.2003)

International Patent Classification (IPC) or both national classification and IPC

IPC7 H01L 33/00, H01L 23/34

Applicant

SEOUL SEMICONDUCTOR CO., LTD. et al

RECEIVED

SEP. 20. 2004

AIP Patent & Law

No. 586

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/KR



Korean Intellectual Property Office
920 Dunsan-dong, Seo-gu, Daejeon 302-701,
Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

KIM, Dong Yup

Telephone No. 82-42-481-5749



**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/KR2004/001153

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This opinion has been established on the basis of a translation from the original language into the following language _____, which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

a. type of material

- ☐ a sequence listing
☐ table(s) related to the sequence listing

b. format of material

- ☐ in written format
☐ in computer readable form

c. time of filing/furnishing

- ☐ contained in the international application as filed.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/KR2004/001153

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | | |
|-------------------------------|--------|------|-----|
| Novelty (N) | Claims | 1-14 | YES |
| | Claims | NONE | NO |
| Inventive step (IS) | Claims | 1-14 | YES |
| | Claims | NONE | NO |
| Industrial applicability (IA) | Claims | 1-14 | YES |
| | Claims | NONE | NO |

2. Citations and explanations :

Reference is made to the following documents:

D1 : US 6274924

D2 : US 6204523

D3 : KR 2001-114224 A

D4 : JP 2000-244022 A

D5 : US 5748658

The present application is related to a high-power light emitting diode package having at least two heat sinks.

D1, the closest document to the present application, discloses a surface mountable LED package having a heat-sinking slug that is inserted into an insert-molded lead frame. It also discloses an LED package structure in which a slug may include an optical reflector cup. And an LED chip and a thermally conducting sub-mount may be attached in that cup.

D2 discloses an LED package structure which is similar to D1 in figure 1.

D3 discloses a light emitting packaging comprising: an LED chip mounted on a base; lead frames connected by lead wires from an LED chip; and a heat extraction material.

D4 discloses a chip type LED package which is composed of an insulating substrate; a flat plate bonded to one surface of the substrate; an LED chip provided on a flat plate. And the flat plate is constituted by bonding first and second metallic thin plate separated from each other in an insulating and separating section to each other.

D5 explains a semiconductor laser element having a heat sink on the rear surface of the substrate.

Although D1 discloses a basic structure for a high power LED package and D4 discloses an LED package containing plural LED chips separated from each other in an insulating and separating section, none of the documents D1-D5 refer to an LED package having at least two heat sinks connected to the main body of the package. D1-D5 are thus considered to be little relevance to the present application.

Compared with the prior art as cited in the International Search Report, the present invention(Claims 1-14) is believed to be novel and to involve an inventive step under PCT Article 33(2) and 33(3).

And the present invention has industrial applicability.